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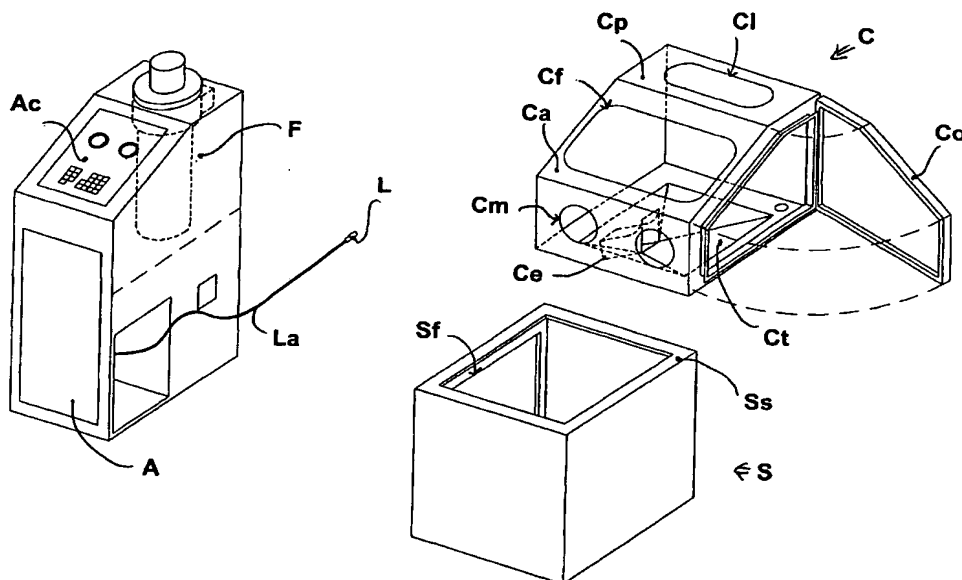
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(54) Title: ABRASIVE CLEANING PLANT WITH SINGLE-BLOCK PLASTIC BOOTH AND INTEGRATED FEEDING AND FILTERING DEVICE



(57) Abstract: The invention is a new cleaning plant using sodium bicarbonate, its mixtures or similar means, provided with a single-block plastic sandblasting booth (C). The booth is positioned on a single-block plastic L-shaped element comprising a support (S), a chamber for the cleaning material feeding device (A) and a chamber for the filtering device (F). The sandblasting booth (C) has the bottom (Ct) shaped like a hopper, a hinged opening side wall (Co) designed to permit access, an inspection window (Cf) provided with transparent glass, and two holes (Cm) positioned side by side for the insertion of long gloves.

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## TITLE

**INDUSTRIAL CLEANING PLANT WITH SINGLE-BLOCK PLASTIC  
BOOTH AND INTEGRATED FEEDING AND FILTERING DEVICES**

## DESCRIPTION

## 5 TECHNICAL FIELD

This patent concerns equipment for industrial cleaning with sodium bicarbonate or similar means. In particular this patent refers to sandblasting booths and plants for the industrial cleaning of medium-small size elements.

## STATE OF THE ART

- 10 At present to remove paint from metal and non-metal objects and to clean objects with rigid surfaces on which solid dirt that is difficult to remove and/or resistant polluting dirt such as grease, oil and other is deposited, cleaning is performed by means of sandblasting, which consists in projecting towards the object, by means of pressurised air, grains of sand or other solid material, in order to remove by abrasion
- 15 all the substances that have adhered to the object to be cleaned.

Basically, a flow of pressurised air, conveyed in a Venturi tube, sucks the sand or abrasive material in granules from a tank and conveys it to a delivery nozzle from which it is discharged at high speed.

- Alternatively, a pressure tank is adopted containing the abrasive material which is
- 20 sucked from it and projected onto the object to be cleaned.

Some sandblasting procedures include the use of water in addition to the air and the abrasive material in granules, for more efficient elimination of the particles removed.

The operator directs the nozzle towards the object to be cleaned, thus projecting the abrasive material in granules onto the surfaces of the object to be cleaned.

- 25 The current sandblasters also comprise a sandblasting booth, a vacuum suction system for the abrasive material in granules and a filtering system for the air leaving the booth.

The booth consists basically of a shell structure provided with access door, a glass

inspection window, two holes with long-sleeved gloves and an outlet at the bottom.

The sandblasting booth is designed to accommodate the object to be cleaned and is provided with a hopper base for the outflow of the air and solid parts (particles removed and sand or abrasive material in granules).

- 5 The inside of the booth contains the nozzle for the emission of the air and the sand or abrasive material in granules.

The front wall of the sandblasting booth is provided with a glass window for checking the sandblasting process and with two gloves with sleeves, inside the sandblasting booth and accessible from the outside, to allow the operator to

- 10 manoeuvre the sandblasting nozzle and rotate the object to be cleaned.

The feed system for the abrasive material in granules is installed separately from the sandblasting booth and comprises upstream a pressurised air source and downstream at least one sandblasting nozzle housed in the sandblasting booth.

- The sandblasting booth discharge hopper is connected to the suction and separation  
15 system for the fumes leaving the booth, said system being designed in such a way as to separate the solid parts (particles removed and abrasive material) from the air.

The current sandblasters have a number of disadvantages.

The sandblasting booths of the current sandblasters are made of bent and welded sheet metal or fibreglass.

- 20 The closed booths made of sheet metal are very noisy, as the air emitted under pressure from the sandblasting nozzle generates sound waves which are amplified by the metal walls of the sandblasting booth; the sand or abrasive material in granules projected onto the object to be cleaned and the metal walls of the sandblasting booth generate noise, causing the vibration of the metal walls of the sandblasting booth.

- 25 The various walls and metal and sheet and metal parts are joined by welding and the welding spots, which generally correspond to the bending corners, can be naturally porous due to welding with the addition of filler metal. This is also due to the fact that in sheet metal welding it is not possible to add significant quantities of filler

metal.

Furthermore, the gaskets are subject to involuntary treatment with the jet, with consequent rapid deterioration. After a short time the booth is no longer sealed, with consequent loss of abrasive material, which is harmful for the users. This porosity or  
5 microporosity causes loss of material, or water in the versions with water, which can occur even after some time. If the system construction material is not stainless steel, the problem could be further accelerated due to the corrosion that occurs as a result of oxidation of the above porosity points.

If aggressive chemical agents are used in the sandblasting process, for example  
10 degreasers or solvents, the metal walls and the welds are affected by the action of said chemical agents, which can trigger metal corrosion or oxidation.

Closed metal booths also require skilled labour for the welding of the various internal and external supports for fixing the various parts to the structure, such as the hinges for the loading door, the brackets for the door locks, the supports for the delivery  
15 means, etc.

The objects placed inside the closed booths and turned on their various sides for cleaning are also inadvertently pushed against the metal walls, which can be surface-damaged, deformed or seriously damaged.

Closed booths made of metal are very heavy due to the construction material used,  
20 with consequent problems of transport, installation and subsequent handling.

Closed booths made of fibreglass partly dampen the noise and absorb occasional shocks, but are affected by the abrasive action of the sand or abrasive material in granules, consequently wearing out and producing and accumulating glass dust in the hopper, in the outlet and in the filtering system.

25 In addition to the above problems strictly relating to closed booths, there are other disadvantages concerning the entire sandblasting system.

The various parts of the current sandblasters (sandblasting booth, suction system for sand or abrasive material in granules and filtering system) constitute independent

elements interconnected by ducts, pipes and cables. All said separate parts require space for installation and maintenance; furthermore the various pipes, ducts and cables hinder the transit and work of the operator.

If the operator has to modify the sandblaster operating parameters, for example  
5 pressure, quantity of sand or abrasive material in granules, amount of water or liquids, he is obliged to interrupt the sandblasting operation, in order to access the suction system and make the necessary modifications.

#### DISCLOSURE OF THE INVENTION

The aim of this invention is to produce a cleaning plant with a sandblasting booth  
10 that optimally withstands shocks and wear.

A further aim of this invention is to produce a cleaning plant with sandblasting booth walls whose structure and material are suitable for soundproofing the inside from the outside of the sandblasting booth.

A further aim is to improve the operator's working conditions from the  
15 environmental point of view, reducing noise and polluting emissions.

A further aim of this patent is to produce a cleaning plant resistant to chemical agents.

A further aim of this patent is to produce a cleaning plant with the various parts combined in one single body, or in any case assembled as one single body.

20 A further aim of this patent is to produce a cleaning plant using sodium bicarbonate, mixtures of it and/or similar means as cleaning material.

A further aim of this patent is to produce a cleaning plant with controls for adjusting and mixing pressurised air, feeding abrasive or cleaning material in granules, adding water or liquids, said controls being located beside the operator's position or in any  
25 case being easily and immediately accessible by the operator.

A further aim of this patent is to produce a prefabricated cleaning system requiring less labour and less time for its manufacture and assembly.

A further aim of this patent is to produce a cleaning plant weighing less than the

plants currently known.

This patent concerns a new cleaning plant with sandblasting booth consisting of single and/or box-type plastic walls.

The subject of this patent is a new cleaning plant with sandblasting booth consisting  
5 of one single continuous element, i.e. single-block.

The subject of this patent is a new cleaning plant using sodium bicarbonate, mixtures of it or similar means as cleaning material.

The subject of this patent is a new cleaning plant with the device for feeding the abrasive material in granules incorporated in the structure.

10 The subject of this patent is a new cleaning plant with air and waste water filtering device incorporated in the structure.

#### SUMMARY DESCRIPTION OF DRAWINGS

The attached drawings are intended to facilitate the description of the invention illustrating a possible form of embodiment. Said drawings are not intended to restrict  
15 the inventive concept covered by this patent.

Figure 1 shows an axonometric view of the various parts, illustrated separately, constituting the new cleaning plant comprising at least one sandblasting booth (C), a base or support (S) for the sandblasting booth (C), a feeding device (A) for the abrasive material in granules and a filtering device (F).

20 Figure 2 shows the front view of a vertical cross section intersecting the sandblasting booth (C) with the related support (S) and the feeding device (A).

Figure 3 shows the front view of a vertical cross section intersecting the sandblasting booth (C) with the related support (S) and the filtering device (F).

Figure 4 shows an axonometric view of the version with single L-shaped element.

#### 25 DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE INVENTION

The new cleaning plant comprises at least one sandblasting booth (C), a support (S) for the sandblasting booth (C), a feeding device (A) for the abrasive or cleaning material in granules, and a filtering device (F).

The sandblasting booth (C) comprises walls (Cp) designed to enclose an area adequate to contain the objects to be cleaned, in addition to permitting their rotation and movement, so that cleaning can be performed on all the surfaces and sides of the object to be cleaned.

- 5 A wall (Co) of the sandblasting booth (C), preferably a vertical side wall, is hinged to the other walls (Cp) to form a door, thus permitting access to the inside of said sandblasting booth (C) to position or withdraw the objects to be cleaned.

The opening wall (Cp) and/or the edge of the sandblasting booth (C) in contact with said opening wall (Cp) are provided with gaskets designed to ensure hermetic seal of

- 10 said opening wall (Cp).

The fixed walls (Cp) and the opening wall (Co) of the sandblasting booth (C) consist of one or two plastic sheets generically parallel and forming a basically closed and hollow parallelepiped. The plastic used to produce the walls (Cp, Co) of the sandblasting booth (C) is preferably polyethylene (PE), polyvinyl chloride (PVC),

- 15 polypropylene (PP), ABS, fibreglass, other similar materials or mixtures and derivatives of the same.

One of the walls (Cp) of the sandblasting booth (C), preferably the front one (Ca), features an inspection window (Cf) and two holes (Cm) positioned side by side. The inspection window (Cf) consists of an opening in the wall (Ca) provided with

- 20 transparent glass designed to allow the operator to observe the inside of the sandblasting booth (C). The two holes positioned side by side (Cm) are provided with two long gloves made of flexible plastic and facing the inside of the sandblasting booth (C), in such a way as to allow the operator to manipulate the object inside said sandblasting booth (C) without coming into direct contact with the
- 25 objects inside the sandblasting booth (C) and at the same time preventing the outflow of air and suspended particles (sodium bicarbonate, salts in general, granules of abrasive material, removed particles) present inside the sandblasting booth (C). A recess (Cl) is provided at the top for a light.

The lower wall of the sandblasting booth (C), i.e. the bottom (Ct), is hopper-shaped in order to collect and convey all the free particles (granules of abrasive material, removed particles) present inside the sandblasting booth (C) towards an outlet duct (Ce).

- 5 The delivery means with nozzle (L) for the emission of the air jet and of the abrasive material in granules is also housed inside the sandblasting booth (C). This delivery means with nozzle (L) is connected to the feeding device (A) by means of a suitable hose (La).

- The sandblasting booth (C) constructed as described above is sustained by an
- 10 adequate support (S) generally consisting of a parallelepiped base, open at the top (Ss) to accommodate the hopper-shaped bottom (Cf) of the sandblasting booth, and provided with an opening (Sf) on the side wall facing the filtering device (F) for connection of the outlet pipe (Ce) of the sandblasting booth (C) hopper (Cf) to the filtering device (F) and/or damp parts separator.

- 15 The feeding device (A) comprises a shell structure (Ai), whose height and profile are such as to be laterally coupled with the sandblasting booth (C), housing inside at least one tank (As) for the abrasive material in granules and a device for sucking the abrasive material in granules from the tank (As) and mixing it with compressed air and/or water.

- 20 The feeding device (A) is provided on its upper front wall with the controls and instruments (Ac) for controlling the operation of the feeding device (A) itself.

The feeding device (A), connected to a pressurised air line and a pressurised water line, sucks the abrasive material from the tank (As) and conveys it via the hose (La) to the delivery means with nozzle (L) housed in the sandblasting booth (C).

- 25 Alternatively a tank containing the pressurised abrasive material can be provided, from which the material flows out at adjustable speed.

The feeding device (A) is such as to be laterally coupled with the sandblasting booth (C), so that the controls and instruments (Ac) for controlling said feeding device (A)



are beside the inspection window (Cf) and the two holes (Cm) in the sandblasting booth (C).

The filtering device (F) comprises a shell structure (Fi) whose height and profile are such as to be laterally coupled with the sandblasting booth (C) and at the rear with  
5 the feeding device (A), inside which there is a suction device (Fa) and a cartridge filter(s) (Fc) provided with cleaning duct (Fk).

The filtering device (F), in particular, is such as to be coupled with the support (S) of the sandblasting booth (C) and with the side opening (Sf) of the support (S) itself.

The shell structure (Fi) of the filtering device (F) is provided at the side with a hole  
10 or opening (Ff) suitable for being coupled with said support (S), so that the outlet pipe (Ce) of the sandblasting booth (C) hopper (Ct) runs into the filtering device (F).

The sandblasting booth (C) with the support (S), the feeding device (A) and the filtering device (F) are such as to couple and connect reciprocally, forming one single element which can be split into its various parts for transport, movement and  
15 handling.

The new cleaning plant with single-block plastic booth and integrated feeding and filtering devices constructed as described above offers numerous advantages.

The new cleaning plant has very compact dimensions, since it incorporates in one single area the sandblasting booth (C), the feeding device (A), the filtering device (F)  
20 and the dust and/or waste water outlet separator without affecting functionality.

The construction material and shape of the walls (Cp) of the sandblasting booth (C) do not produce the soundbox effect normally generated in traditional sandblasting booths, in its turn reducing the overall noise level of the plant.

The plastic used is not porous and is not subject to corrosion or oxidation. As the  
25 sandblasting booth (C) is built in one single element, there are no joints with possibility of breakage and outflow of material.

As the sandblasting booth (C) and also the support (S) and the shell structures (Ai, Fi) of the feeding device (A) and/or filtering device (F) can be produced in one single

plastic body, manual operations and work for assembly and fixing of the various parts are considerably reduced.

The plastic moulding process permits greater precision in the repeatability of the pieces, avoiding the risk of human error.

- 5 All this therefore reduces assembly times and consequently overall production costs.

The use of plastic for the production of various parts of the new cleaning plant will limit the weight of the plant as a whole, with consequent advantages for transport and the possibility of being removed and shifted at any time with no need to use special equipment.

- 10 The use of plastic for the production of various parts of the new cleaning plant, and in particular of the sandblasting booth (C), increases the resistance of the various parts and in particular of the sandblasting booth (C) to shocks.

The new cleaning plant is not subject to corrosion and/or oxidation of any chemical substances used in the cleaning process, as the sandblasting booth (C) and the

- 15 various pipes, made of plastic, do not oxidise and they withstand corrosion.

It is expedient for the base (S) and the shell structures (Fi) and (Ai) to be made in one single element provided with side and/or upper openings for fitting the equipment described.

- Therefore, with reference to the above description and the attached drawing, the  
20 following claims are put forth.

## CLAIMS

1. Cleaning plant, characterised in that it uses sodium bicarbonate, mixtures of it or similar means as cleaning material and comprises a single-block plastic sandblasting booth (C).
- 5 2. Cleaning plant according to claim 1, characterised in that it comprises a support (S) for the sandblasting booth (C), a feeding device (A) for the cleaning material in granules, a plastic filtering device (F) integrated reciprocally and with said sandblasting booth (C).
3. Cleaning plant according to claims 1, 2, characterised in that said sandblasting  
10 booth (C) has a hinged opening side wall (Co) designed to permit access to the inside of said sandblasting booth (C) for positioning or withdrawing the objects to be cleaned, and wherein said opening wall (Cp) and/or the edge of the sandblasting booth (C) in contact with said opening wall (Cp) are provided with gaskets designed to ensure hermetic seal of said opening wall (Cp).
- 15 4. Cleaning plant according to claims 1, 2, 3, characterised in that said sandblasting booth (C) features, on a sloping front upper wall (Ca), an inspection window (Cf), provided with transparent glass, and two holes (Cm) positioned side by side for the insertion of long gloves.
5. Cleaning plant according to claims 1, 2, 3, 4, characterised in that said  
20 sandblasting booth (C) has the bottom (Ct) shaped like a hopper and connected to an outlet pipe (Ce).
6. Cleaning plant according to claims 1, 2, 3, 4, 5, characterised in that the support (S) generally consists of a parallelepiped base, open at the top (Ss) to accommodate the hopper-shaped bottom (Ct) of the sandblasting booth, and provided  
25 with an opening (Sf) on the side wall facing the filtering device (F) to permit the connection of the outlet pipe (Ce) of the sandblasting booth (C) hopper (Cf) to the filtering device (F).
7. Cleaning plant according to the previous claims, characterised in that the walls

(Cp) of the sandblasting booth consist of two plastic sheets generically parallel to each other and joined along the edges to form a closed hollow parallelepiped.

8. Cleaning plant according to claim 7, characterised in that the inside of the walls (Cp) between said two sheets of the sandblasting booth (C) is filled with insulating  
5 material.

9. Cleaning plant according to the previous claims, characterised in that the feeding device (A) comprises a shell structure (Ai), whose height and profile are such as to be laterally coupled with the sandblasting booth (C).

10. Cleaning plant according to claim 9, characterised in that the shell structure  
10 (Ai) of the feeding device (A) houses at least one tank (As) for the cleaning material to be sent, via the pipe or hose (La), to the delivery means with nozzle (L) housed in the sandblasting booth (C).

11. Cleaning plant according to the previous claims, characterised in that the support (S), the suction shell structure (Ai) and the filtering shell structure (Fi)  
15 constitute one single L-shaped element.

12. Cleaning plant according to the previous claims, characterised in that the top of the filtering shell structure (Fi) is provided with a scroll, with holes at the bottom and side, in which the suction fan rotor is fitted.

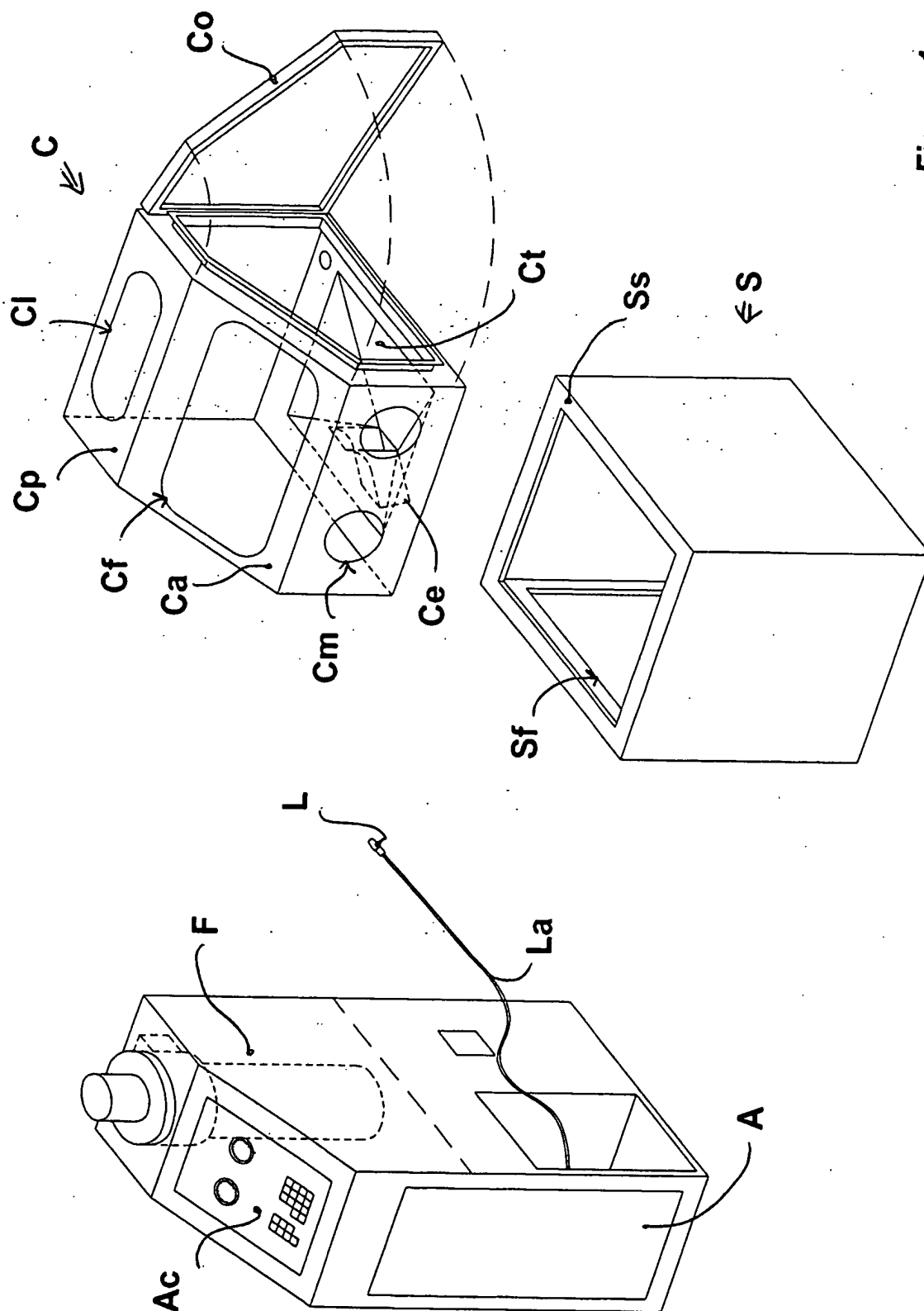


Fig. 1

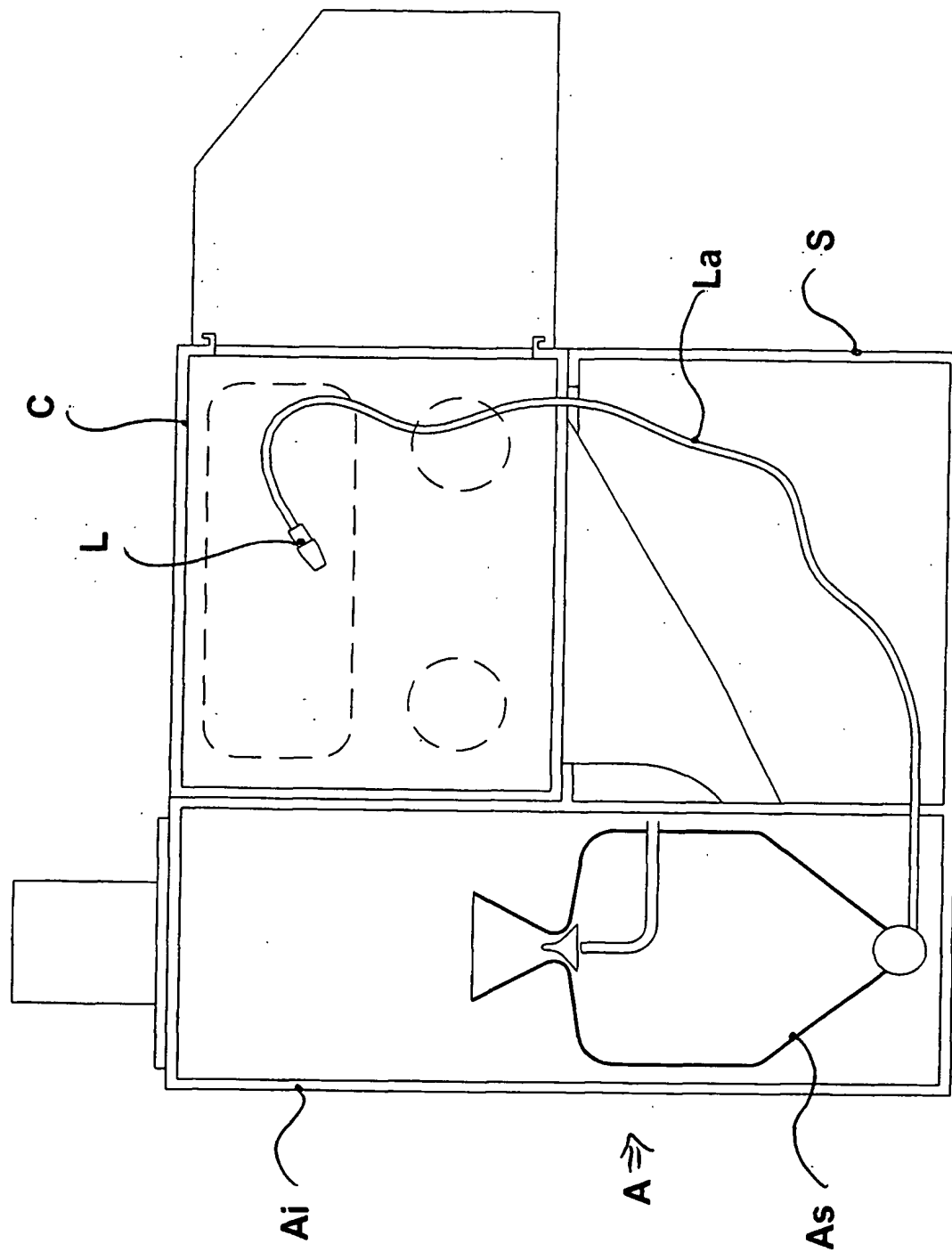


Fig. 2

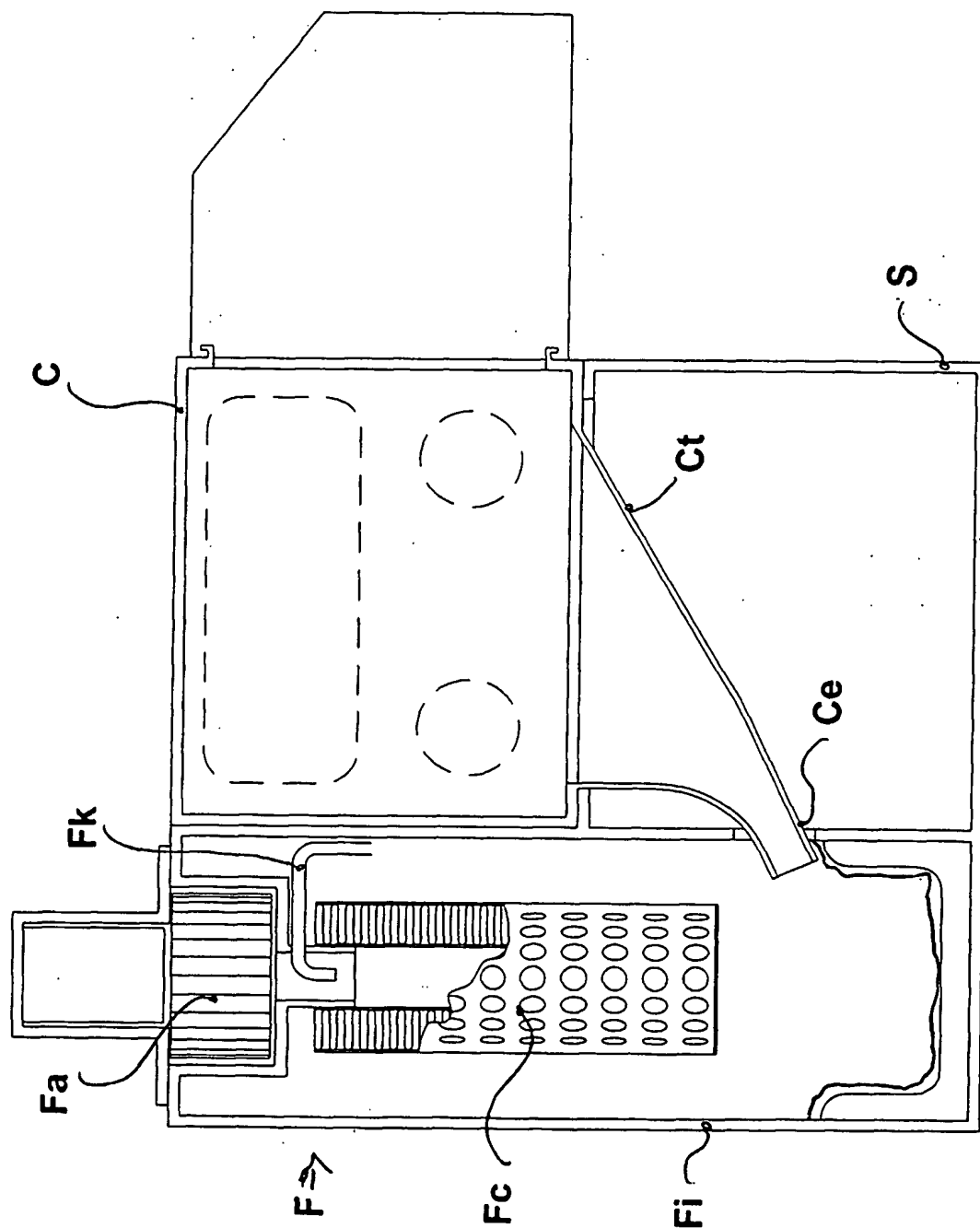


Fig. 3

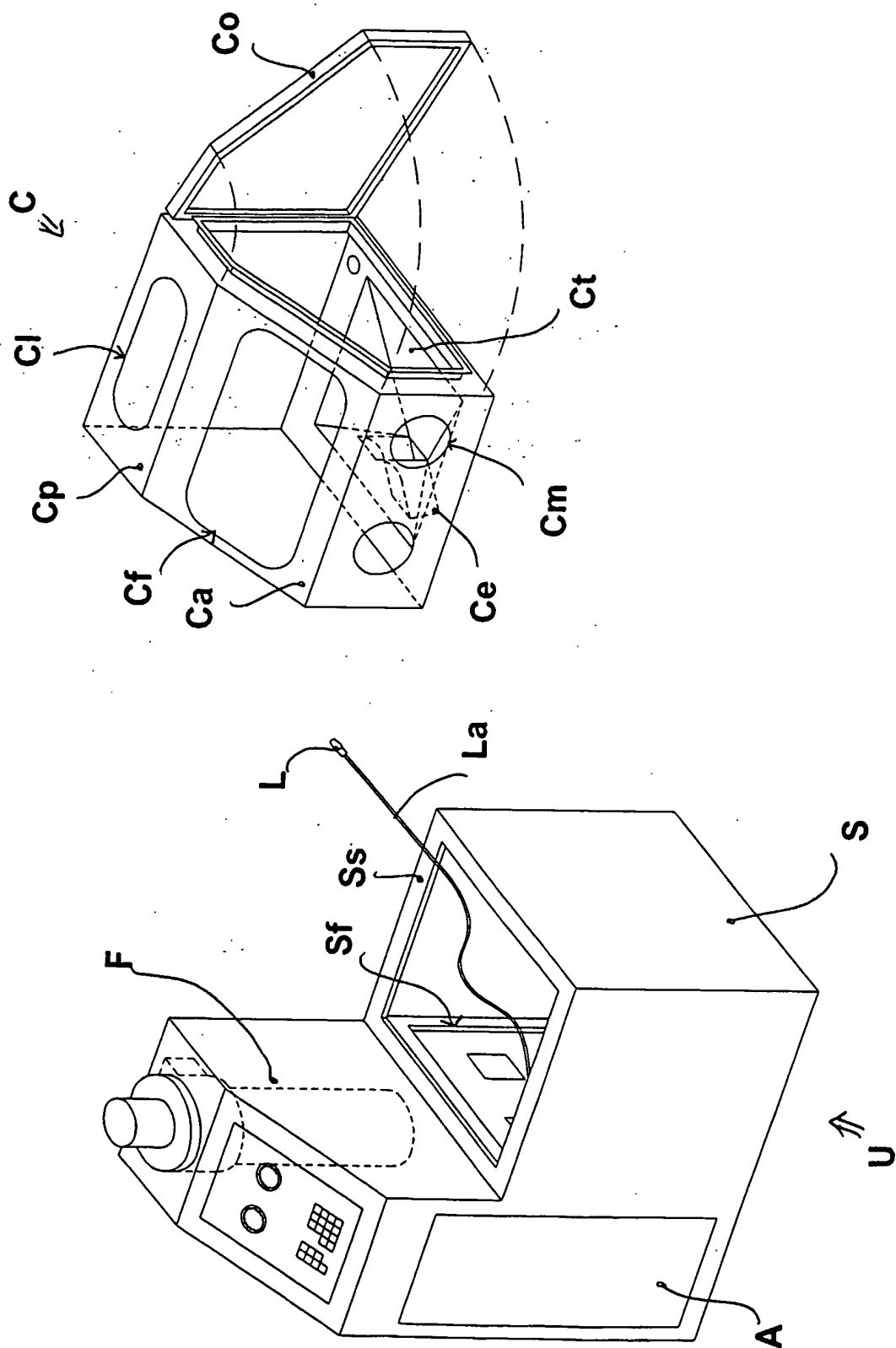


Fig. 4



# INTERNATIONAL SEARCH REPORT

International Application No

PCT/IT 03/00379

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B24C1/00 B24C3/04 B24C9/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B24C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>US 6 390 898 B1 (PIEPER GERARD)  21 May 2002 (2002-05-21)  column 1, line 43 - line 48  column 5, line 1 - line 20  column 8, line 30 - line 31  column 9, line 50 - line 54  column 11, line 5 - line 7  claim 26  figures 1-3,5</p>	1-12

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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\*A\* document defining the general state of the art which is not considered to be of particular relevance

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Date of the actual completion of the international search

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Name and mailing address of the ISA

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International Application No

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